

REMARKS

The Office Action dated May 7, 2010 has been received and carefully noted. The above amendments to the claims and the following remarks are submitted as a full and complete response thereto.

By this Response, claim 1 has been amended to more particularly point out and distinctly claim the subject matter of the present invention. Support for the amended features may be found, at least, in paragraph [0057] of the Specification of the present application. No new matter has been added. Accordingly, claims 1-7 are currently pending in the application, of which claim 1 is an independent claim.

REJECTION UNDER 35 U.S.C. § 102:

Claims 1-7 were rejected under 35 U.S.C. § 102(e) as being anticipated by Takenaka (U.S. Publication No. 2003/0125839). The Office Action took the position that Takenaka discloses all of the elements of the claims. It is respectfully asserted that, for at least the reasons provided herein below, Takenaka fails to teach or suggest the recitations of the pending claims. Reconsideration is requested.

Claim 1, upon which claims 2-7 depend, is directed to a leg type mobile robot including a body, legs each connected to the body via a first joint, and feet, each connected to an end part of the leg via a second joint. Each foot includes at least one foot portion, which has a ground area to be grounded on a floor surface at a bottom thereof, and a floor reaction force detector configured to detect a floor reaction force acting from

a floor surface through the foot portion. In a plane view, when the robot is in a standing-still state, a center of the second joint is offset against a position, the position is the position in the ground area and has an equal distance to each remotest point of the ground area, and a center of the floor reaction force detector is closer to the position than to the center of the second joint.

Accordingly, Applicants respectfully submit that Takenaka fails to disclose or suggest all of the elements of any of the presently pending claims.

Takenaka generally relates to a floor shape estimation system of a legged mobile robot, in particular a biped walking robot. The system estimates a floor shape, more specifically a foot-to-foot floor inclination difference based on at least a control error of the total floor reaction force's moment and based on the estimated value. The system also corrects a feet compensating angle based on the estimated value. Further, the system estimates a floor shape, namely a foot floor inclination difference, based on at least a control error of the foot floor reaction force about a desired foot floor reaction force central point. The system additionally corrects a foot compensating angle based on the estimated value. The system can provide an estimate of the shape of a floor with which the robot is in contact. If the floor shape is different from what was expected, the system can produce a floor reaction force as desired by absorbing the influence of the difference between the expected and actual shape.

In contrast to Takenaka, amended independent claim 1 of the present application recites that the “in a plane view, when the robot is in a standing-still state, a center of the

second joint is offset against a position, the position is the position in the ground area and has an equal distance to each remotest point of the ground area, and a center of the floor reaction force detector is closer to the position than to the center of the second joint.”

Takenaka cannot disclose the above-quoted feature of amended independent claim 1, because Fig. 2 of Takenaka illustrates that that the center of joint 18R(L) is in line with a center point of a force sensor 44, which is in line with the center point of the foot. Because the center of joint 18R(L) of Takenaka is in line with the center point of the foot, the center of joint 18R(L) cannot be interpreted to be offset against the center point of the foot. In other words, the center of joint 18R(L) in Takenaka cannot “in a plane view, when the robot is in a standing-still state, a center of the second joint is offset against a position, the position is the position in the ground area and has an equal distance to each remotest point of the ground area.” See, for example, amended independent claim 1. Because center of joint 18R(L) in Takenaka is not offset against the center point of the foot, Takenaka cannot disclose that “a center of the second joint is offset against a position,” in a plane view, when the robot is in a standing-still state, as recited in amended independent claim 1.

Furthermore, the Office Action relied on paragraph [0274] of Takenaka. However, this portion of Takenaka describes estimating the foot-to-foot inclination difference during walking and when the estimated value of the foot-to-foot floor inclination difference is added to the feet compensating angle, the actual total floor reaction force will be the same as that when the robot walks on the supposed floor, even

if the foot-to-foot inclination difference exists. Contrary to the contentions made in the Office Action, there is no description or suggestion that would enable a person of ordinary skill in the art to offset a center of the second joint, in a plane view, when the robot is in a standing-still state, against a position, which is “the position in the ground area and has an equal distance to each remotest point of the ground area,” as recited in amended independent claim 1. The estimation of the foot-to-foot inclination difference and the feet compensating angle does not provide any suggestion regarding the particular features of amended independent claim 1.

Moreover, paragraph [0274] of Takenaka provides that when the n-th foot floor inclination difference is estimated during walking and when the estimated value of the n-th foot floor inclination difference is added to the n-th foot compensating angle, the actual n-th foot floor reaction force will be the same as that when the robot walks on the supposed floor, even if the n-th foot floor inclination difference exists. Once again, similar to other portions of Takenaka, there is no teaching or suggestion in paragraph [0274] of “in a plane view, when the robot is in a standing-still state, a center of the second joint is offset against a position, the position is the position in the ground area and has an equal distance to each remotest point of the ground area,” as recited in amended independent claim 1. Nothing in the estimation of the n-th foot floor inclination difference is there a teaching or suggestion of the configuration of the foot of the robot as recited in claim 1. Even if the ground area is interpreted broadly, as submitted on top of page 6 of the Office Action, there would still be no teaching or suggestion that would

enable a person of ordinary skill in the art to that the center of the second joint (i.e., the center of the ankle joint) is offset against a position, which is “the position in the ground area and has an equal distance to each remotest point of the ground area,” as recited in amended independent claim 1.

Furthermore, the Office Action relied on Fig. 2 of Takenaka. However, the description of Fig. 2 of Takenaka is silent as to the particular alignment of the ankle joints 18R(L), sensor 44, and the foot, and consequently Takenaka cannot be relied on to disclose the above-quoted features of amended independent claim 1. For example, the description of Takenaka in support of Fig. 2, for example, does not disclose how “in a plane view, when the robot is in a standing-still state, a center of the second joint is offset against a position, the position is the position in the ground area and has an equal distance to each remotest point of the ground area, and a center of the floor reaction force detector is closer to the position than to the center of the second joint.” Without such corresponding description in Takenaka, the figures of Takenaka are insufficient to anticipate such features, since there is not, for example, any indication that the figures are drawn to scale. Therefore, the drawings in Takenaka alone cannot be relied on to anticipate the above-quoted features of amended independent claim 1.

Furthermore, even if Fig. 2 of Takenaka were measured by an eye in a side view, the center of a second (ankle) joint of Takenaka would be interpreted to be in line with the center of the floor reaction force detector (and the position). Therefore, Takenaka cannot disclose “in a plane view, when the robot is in a standing-still state, … a center of

the floor reaction force detector is closer to the position than to the center of the second joint,” because the center of joint 18R(L) of Takenaka is in line with a center point of a force sensor 44.

Additionally, the meaning of “ground area” is not open to broad interpretation, as this term is defined in the present application’s specification. Paragraph [0003] of the present application explains: “The center of the ankle joint is offset (bias) backward and inward to the bottom surface, i.e. ground area, to be grounded on a floor surface.” Thus, the “ground area” must be interpreted as the bottom surface of the foot to be grounded on a floor surface. It appears that the Office Action has mistakenly interpreted “ground area” to refer to a stride distance of the bipedal robot. Such an interpretation is incorrect and is ruled out by the explicit definition of “ground area” provided in the present application’s specification.

The Office Action responded to the distinctions presented above with respect to “a center of the floor reaction force detector is closer to the position than to the center of the second joint,” by alleging that these features are taught by element 108, Fig. 2, “particularly the ‘foot floor reaction force’,” and paragraph [0138], and “again particularly ‘an actual foot floor reaction force detector’.” The Office Action noted that Fig. 2 of Takenaka is “an explanatory side view showing the structure of the foot of a biped robot.”

It appears that the Office Action interprets that “the position” is disclosed in Fig. 2 of Takenaka, in which the foot tip (= the remotest point) is touching the floor (or ground)

in a forward motion, and at this moment, the distance (from the floor) to the foot tip becomes minimum. See assertion made on page 3 of Office Action stating “wherein the tip of the foot has been considered as touching minimum distance in a forward motion”). While Fig. 2 of Takenaka may be “an explanatory side view showing the structure of the foot of a biped robot,” and while it can be understood how the “actual foot floor reaction force detector” of Takenaka is being alleged to correspond to the recited “floor reaction force detector,” the Office Action’s response seems to have completely missed any disclosure allegedly corresponding to “is closer to the position than to the center of the second joint.” To further clarify the position of the center of the floor reaction force detector, independent claim 1 has been further amended to recite, “in a plane view, when the robot is in a standing-still state, a center of the second joint is offset against a position, the position is the position in the ground area and has an equal distance to each remotest point of the ground area, and a center of the floor reaction force detector is closer to the position than to the center of the second joint.” As explained above, this feature related to the relative position of the detector and the joint is absent from Takenaka. Thus, Takenaka cannot anticipate the features of claim 1, or of the claims that depend from it, even if Fig. 2 is a plane view and even if the “actual foot floor reaction force detector” were to correspond to the recited “floor reaction force detector.” Thus, the rejection cannot be supported by the comments included in the “Response to Arguments” section of the Office Action (page 6 thereof).

Under U.S. Patent Law, “[a] claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.” (See MPEP § 2131, citing to *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987)). Further, U.S. Patent Law requires that “[t]he elements must be arranged as required by the claim...” *In re Bond*, 910 F.2d 831, 15 USPQ2d 1566 (Fed. Cir. 1990). Because Takenaka does not disclose each and every element as required by claim 1, the Office Action fails to establish that claim 1 is anticipated by Takenaka.

Applicants respectfully encourage the Examiner to compare Figure 7 of the present application (including force sensor 52 and ankle joints 15,16) to Fig. 2 of Takenaka. It is easy to see how a center of ankle joints 15,16 are offset in plane view from a center of sensor 52. In contrast, Fig. 2 of Takenaka appears on its face to show **joint 18R (L) directly above sensor 34**, without any visible offset in the plane view. (Emphasis added) Furthermore, the written description of Takenaka does not indicate that any such offset exists.

Claims 2-7 depend respectively from, and further limit, independent claim 1. Thus, it is respectfully submitted that each of claims 2-7 recites subject matter that is neither disclosed nor suggested in Takenaka. Withdrawal of the rejection of claims 2-7 is consequently requested.

For the reasons set forth above, it is respectfully submitted that each of claims 1-7 recites subject matter that is neither disclosed nor suggested in the cited art. It is,

therefore, respectfully requested that all of claims 1-7 be allowed, and that this application be passed to issuance.

CONCLUSION:

In view of the above, Applicants respectfully submit that the claimed invention recites subject matter which is neither disclosed nor suggested in the cited prior art. Applicants further submit that the subject matter is more than sufficient to render the claimed invention unobvious to a person of skill in the art. Applicants therefore respectfully request that each of claims 1-7 be found allowable and this application passed to issue.

If for any reason the Examiner determines that the application is not now in condition for allowance, it is respectfully requested that the Examiner contact, by telephone, the Applicants' undersigned attorney at the indicated telephone number to arrange for an interview to expedite the disposition of this application.

In the event this paper is not being timely filed, the Applicants respectfully petition for an appropriate extension of time.

Any fees for such an extension together with any additional fees may be charged to Counsel's Deposit Account 50-2222.

Respectfully submitted,

/Alicia M. Choi/

Alicia M. Choi
Attorney for Applicants
Registration No. 46,621

Customer No. 32294

SQUIRE, SANDERS & DEMPSEY L.L.P.

14th Floor

8000 Towers Crescent Drive
Vienna, Virginia 22182-6212
Telephone: 703-720-7800
Fax: 703-720-7802

AMC:dk